

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-237728

(43) 公開日 平成8年(1996)9月13日

(51) Int.Cl. <sup>6</sup>	識別記号	片内整理番号	P I	技術表示箇所
H 0 4 Q 7/34			H 0 4 Q 7/04	B
7/22			H 0 4 B 7/26	1 0 8 Z
7/28			H 0 4 Q 7/04	K

審査請求 未請求 請求項の数 9 O L (全 8 頁)

(21) 出願番号 特願平7-331840

(22) 出願日 平成7年(1995)12月20日

(31) 優先権主張番号 特願平6-327793

(32) 優先日 平6(1994)12月28日

(33) 優先権主張国 日本 (J P)

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(54) 【発明の名称】 隣接ゾーン情報自動生成方法

(57) 【要約】

【課題】 ゾーン内移動局に報知するための周辺ゾーン情報を自動生成する。

【解決手段】 各基地局において他の基地局からの下り電波の電界強度を測定し、所定電界強度以上の電波についてその受信電波を解析して、同一移動通信システムで使用されている電波であるか否かを判定し、所定電界強度以上かつ共通移動通信システムで使用していると判定された電波の情報を周辺基地局情報として生成する。

周波数	受信電界	電波種別	周辺判定
#1	36db $\mu$	同一	○
#2	42db $\mu$	異方式	×
#3	32db $\mu$	同一	○
#4	38db $\mu$	同一	○
#5	-5db $\mu$		×
#6	0db $\mu$		×

○ 隣接周辺と判断される電波数番号

× 隣接周辺でないや解析される電波数番号

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## 【特許請求の範囲】

【請求項1】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 各ゾーンにおいて全周波数の下り電波の電界強度を測定して電界強度が規定値以上であるか否かを判定し、  
(b) 上記規定値以上の電界強度の下り電波を解析してそれらの下り電波が上記共通移動通信システムの電波であるか否かを判定し、  
(c) 測定された電界強度が上記規定値以上であり、かつ上記共通の通信システムで使用されているものであると判定された電波の周波数チャネルを周辺基地局の周波数チャネル情報として生成する。

【請求項2】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 無線基地局において、自無線基地局の下り周波数以外の全下り周波数帯域の電波の電界強度をそれぞれ測定し、  
(b) その測定結果から自基地局の周囲に下り電波が存在するか否かを判定し、  
(c) 存在すると判定された周波数の電波に対して、無線基地局自身が、その受信部によって、その電波が上記共通の移動通信システムに使用されているものか否かを解析し、  
(d) その解析結果に基づいて、それらの電波を発射している無線基地局が周辺基地局であるか否かの判定を行い、  
(e) 上記測定結果と解析結果に基づいて、上記自無線基地局の周辺基地局状態を認識し、隣接基地局一覧情報の生成、更新を行う。

【請求項3】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 無線基地局において、自無線基地局の下り周波数以外の全下り周波数帯域の電波の電界強度を測定し、  
(b) その測定結果から自基地局の周囲に下り電波が存在するか否かを判定し、  
(c) 存在すると判定された周波数の電波が、上記共通の移動通信システムに使用されているものか否かを解析する要求を移動局に対して送信し、  
(d) 上記要求を受信した移動局は、指示された周波数の電波が上記共通の移動通信システムに使用されているものか否かの解析を行い、  
(e) その解析結果を要求を受けた無線基地局に対して報告し、  
(f) 上記報告を受けた無線基地局は、その解析結果に基

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づいてその電波を発射している無線基地局が周辺基地局か否かの判定を行い、

(g) 上記測定結果と解析結果に基づいて自無線基地局の周辺基地局状態を認識し、隣接基地局一覧情報の生成、更新を行う。

【請求項4】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

10 (a) 移動局で在圏ゾーンの無線基地局の下り周波数以外の全下り周波数の電波の電界強度を測定し、  
(b) その測定結果を、上記在圏ゾーンの無線基地局に対して報告し、  
(c) 上記報告を受信した上記無線基地局は、その測定結果に所定電界強度以上の電波が存在するか判定し、存在すればそれら電界強度が所定値以上の電波が上記共通の移動通信システムに使用されているものか否かの解析要求をその電波の周波数を指定して上記移動局に対して送信し、  
20 (d) 上記要求を受信した移動局は、指示された周波数の電波に対して解析を行い、  
(e) 上記移動局はその解析結果を要求を受けた上記無線基地局に対して報告し、  
(f) 上記報告を受けた無線基地局は、上記測定結果と解析結果に基づいてそれらの電波を発射している無線基地局が周辺基地局か否かの判定を行い、  
(g) 自無線基地局に対する周辺基地局状態を認識し、隣接基地局一覧情報を上記隣接ゾーン情報として生成、更新を行う。

30 【請求項5】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 移動局に於て、自律的に全下り周波数帯域の電波の電界強度を測定し、  
(b) その測定結果から上記移動局が在圏中の無線基地局の周辺の他の無線基地局からの下り電波が存在するか否かを判定し、  
(c) 存在すると判定される電波が、上記共通の移動通信システムに使用されているかを上記移動局が自律に解析し、  
(d) 上記解析結果をもって、その移動局が在圏中の無線基地局の周辺の無線基地局の状態を上記移動局が認識し、  
(e) これにより收拾される上記周辺無線基地局の周辺情報を、上記在圏中の無線基地局に対して報告を行い、  
(f) この報告を受けた無線基地局は、この報告をもとに隣接基地局一覧情報の生成、更新を行う。

【請求項6】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービ

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サービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 移動局に於て、現在在圏中の移行元ゾーンから移行先ゾーンへゾーン移行する際に、上記移行元ゾーンの無線基地局から発射される下り制御チャネル電波の電界強度の測定と、上記移行先ゾーンの無線基地局から発射される制御チャネル電波の電界強度の測定とを行い、

(b) これらの測定結果を元に、移行元ゾーンが、移行先ゾーンの隣接周辺であるかを判定し、

(c) 隣接周辺と判定されると、上記移行元ゾーンの無線基地局の存在を上記移行先ゾーンの無線基地局に通知し、

(d) 上記通知を受信した上記移行先無線基地局は、この通知をもとに隣接基地局一覧情報の生成、更新を行う。

【請求項7】 共通の移動通信システムに属する無線基地局がそれぞれ設けられた複数のゾーンからなるサービスエリア内の各基地局における隣接ゾーン情報の生成方法であり、以下のステップを含む：

(a) 移動局に於て、現在在圏中の移行元ゾーンから移行先ゾーンへゾーン移行する際に、上記移行元ゾーンの無線基地局から発射される下り制御チャネル電波の電界強度の測定と、上記移行先ゾーンの無線基地局から発射される制御チャネル電波の電界強度の測定とを行い、

(b) これらの測定結果を上記移行先ゾーンの無線基地局に対して報告を行い、

(c) 上記報告を受けた無線基地局はこの報告に基づいて移行元ゾーンの無線基地局が上記移行先ゾーンの無線基地局の隣接周辺かどうかを判断し、隣接基地局一覧情報の生成、更新を行う。

【請求項8】 請求項3の隣接ゾーン情報自動生成方法において、更に以下のステップを含む：

(h) 上記無線基地局に在圏中の移動局でその在圏中無線基地局の下り周波数以外の周波数電波の電界強度を測定し、

(i) その測定結果を、上記在圏中無線基地局に対して報告を行い、

(j) 上記報告を受信した無線基地局は報告された測定結果から、上記移動局が、その電波の解析が行えるか否かの判定を行ない、行えると判定されると、その電波が、上記共通の移動通信システムに使用されているか否かの解析要求の移動局に対して送信し、

(k) 上記要求を受信した上記移動局は、指示された周波数電波に対して解析を行い、

(l) その結果を要求を受けた無線基地局に対して報告し、

(m) この報告を受けた無線基地局は、その情報を元にその電波を発射している無線基地局が周辺基地局か否かの判定を行い、

(n) 自無線基地局に対する周辺基地局状態を認識し、上記隣接基地局一覧情報の生成、更新を行う。

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【請求項9】 請求項8の隣接ゾーン情報自動生成方法において、更に以下のステップを含む：

(o) 上記移動局で、現在在圏中の移行元ゾーンから移行先ゾーンへゾーン移行する際に、上記移行元ゾーンの無線基地局から発射される下り制御チャネル電波の電界強度の測定と、上記移行先ゾーンの無線基地局から発射される制御チャネル電波の電界強度の測定とを行い、

(p) これらの測定結果を上記移行先ゾーンの無線基地局に対して報告を行い、

(q) 上記報告を受けた無線基地局はこの報告をもとに、移行元ゾーンの無線基地局が、上記移行先ゾーンの無線基地局の隣接周辺かどうかを判断して、上記隣接基地局一覧情報の生成、更新を行う。

【発明の詳細な説明】

【0001】

【技術分野】この発明は、移動通信システムにおける各ゾーンの基地局が移動局に報知する周辺ゾーン情報の生成方法に関する。

【0002】

【従来の技術】移動通信システムにおいては、サービスエリアを複数のゾーン（セル）に分割し、そのゾーンにそれぞれ無線基地局を設け、移動局は在圏するゾーンに割当てられた周波数のチャネルを使ってそのゾーンの無線基地局を介して他の移動局又は固定通信端末と通信をする。移動通信システムでは、ゾーン移行により通信中チャネル切替えを行ったり、同一ゾーン中においても受信状態の劣化による通信中チャネル切替えを行ったり、ゾーン移行により、一旦通信を中断した後、別の基地局を介して通信を再開することが行われる。このような通信中チャネル切替えや再接続形のチャネル切替えの各制御を確実にかつ高速に行うために、移動局は在圏基地局の周辺に存在する基地局とこれに関する情報（即ち、周辺ゾーンのチャネル周波数）を必要とする。そのため、各ゾーンの無線基地局はそのゾーン内の移動局に対しこの周辺基地局の識別コード及び／又はチャネル周波数を報知情報として例えば制御チャネルを通して常時報知し、それによって移動局のチャネル切り替え制御を高速化すると共に適切なゾーン移行を行っている。このような周辺ゾーン情報（あるいは周辺基地局情報とも呼ぶ）を報知する制御チャネルを止まり木チャネルと呼ぶことがある。

【0003】

【発明が解決しようとする課題】運用しているサービスエリアの拡大、縮小、エリア内の通信トラフィック分布の変化、電波伝播環境の変化等（周辺環境変化と呼ぶ）にともない基地局の移設、増設、廃止、割当チャネル周波数の変更などが行われる。このような変更にとともに、各基地局はその周辺基地局の使用チャネル周波数が変更された場合には、止まり木チャネルで報知すべき周辺基地局情報を変更する必要がある。従来においては各無線基

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地局（以下単に基地局と記す）において、受信装置により他基地局からの電波の電界強度測定し、受信信号の解析を行って人間がその周辺基地局の情報を収集管理し、これをもとに報知すべき周辺基地局情報データを作成し、この周辺基地局情報を止まり木チャネルを通してゾーン内の移動局に報知していた。あるいは集約制御装置を介して行うデータ転送などで行っていた。

【0004】更に周辺基地局の判定を行う場合に、それぞれの無線基地局についてそれらからの広い範囲にわたる放射電波の電界強度を測定し、この測定結果に基づいて基地局の隣接状態を判定している。従って、データの収集に多大の労力と時間を必要とする問題があった。この発明の目的は、周辺ゾーン情報を自動的に生成することが出来る方法を提供することである。

【0005】

【課題を解決するための手段】請求項1の発明の基本原則によれば、受信されるそれぞれの周波数の電界強度を測定して電界強度が規定値以上であるか否かを判定すると共に、その受信信号を解析してその信号が同一移动通信システム（即ち同じ事業者によるシステム）であるか否かを判定し、測定された電界強度が規定値以上であり、かつ同一通信システムであると判定された場合に、その周波数のチャネルは周辺ゾーンのものであると判定する。この場合、測定と解析を全て基地局で行う場合と、全て移動局で行いその結果を基地局に報告する場合と、移動局が測定を行って基地局に報告し、基地局で測定結果の解析を行う場合と、移動局と基地局の両方で測定と解析を行い、移動局は解析結果を基地局に報告する場合、等が可能である。

【0006】請求項2の発明によれば各基地局でその周辺に存在する他基地局からの下り電波の電界強度を測定し、その測定結果から自基地局に対する周辺基地局の下り電波が存在するかの判定を行い、存在する場合は、その電波が同じシステムで使用されているものであるかをその基地局で受信信号の解析により判定し、その結果から、その電波の基地局が自基地局の周辺基地局かの判定を行い、自基地局に対する周辺基地局状態を認識して、隣接基地局一覧情報を自動的に生成、更新する。

【0007】請求項3の発明によれば、請求項2の上記解析を移動局に行わせ、この報告をもとに、隣接基地局一覧情報の生成、更新を行う。請求項4の発明によれば、移動局で在圏基地局以外の基地局下り電波の電界強度を測定し、その測定結果を在圏中の基地局へ報告し、その報告をもとに基地局は移動局に対しその電波が同じシステムのものであるか解析させ、その解析結果をもとに基地局で隣接基地局一覧情報の生成、更新を行う。

【0008】請求項5の発明によれば、移動局で下り電波の電界強度を測定し、自在圏基地局外の電波についてそれが同じシステムのものであるか解析し、その結果から在圏基地局の周辺基地局状態を認識し、周辺基地局情

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報を在圏基地局へ送り、これを受信した自圏基地局からの情報をもとに隣接基地局一覧情報の生成、更新を行う。

【0009】請求項6の発明によれば、ゾーン移行をすると移動局は移行元及び移行先の各ゾーンの基地局下り電波の電界強度を測定し、その測定結果から移行元ゾーンが、移行先ゾーンの周辺であるか判定し、周辺と判定した場合に、その判定結果を移行先基地局へ送信し、移行先基地局でこの報告をもとに、隣接基地局一覧情報の生成、更新を行う。

【0010】請求項7の発明では請求項6における測定結果を移行先基地局に報告して、移行先基地局で前記周辺かどうかの判定を行い、周辺基地局一覧情報の生成、更新を行う。請求項8の発明では請求項3の発明と請求項4の発明とを組合せたものであり、請求項9の発明は請求項8の発明に請求項7の発明を更に加えたものである。

【0011】

【発明の実施の形態及び実施例】例えば図1に示すように、サービスエリアが複数のゾーン $Z_1, Z_2, Z_3, \dots$ に分割され、各ゾーンに基地局 $BS_1, BS_2, BS_3, \dots$ が設けられている。移動局 $MS$ は在圏しているゾーン $Z_i$  ( $i=1, 2, \dots$ )の基地局 $BS_i$ と送受信することにより他の移動局や固定端末との通信を基地局 $BS_i$ を介して行う。

【0012】この発明の原理によれば、周辺基地局の情報を収集するために、各周波数の受信信号が同一システムにおける周辺ゾーンの基地局からの受信信号であるか否かを判定する。即ち、他基地局からの下り電波を受信してその電界強度を測定すると共に、測定した受信信号を解析してその受信信号が同一通信システム（同一事業者によるシステム）の基地局からの信号であるか否かを判定する。電界強度が規定値以上であり、かつ同一通信システムに属すると判定された場合、その受信信号は周辺基地局から送信された信号であると判定する。

【0013】受信信号が同一通信システムの基地局からの信号である判定条件は、以下のものがある。

・周波数がそのシステムで使用しているものと一致すること。

・信号の種類（デジタル信号か否か）が同じであり、受信可能なこと。システムが異なると例えば同期信号の形態が異なることから判定できる。

【0014】・変調信号フォーマット（構成）が同じであること。

・受信信号形ゾーンの止まり木チャネルの報知信号であれば、報知信号に含まれている通信システムに付与されている識別番号が所定のものであること。これらの条件のうちの予め決めた1つ又は複数満足している場合に、同じ通信システムに属する他の基地局からの信号であると判定する。これらの測定と解析は、例えば下り制御チャネルについて行う。

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【0015】この様に、周辺基地局情報の収集のための電界強度の測定と受信信号の解析を実施する形態として、基地局単独で行う場合と、ゾーン内各移動局が行って基地局に報告する場合と、基地局と移動局が共同して行う場合が可能であり、これらについても以下のように様々な実施形態がある。

A：基地局が単独に測定、解析を行う場合。

【0016】この発明の第1の観点による方法では、図3Aに示すように基地局BS<sub>i</sub> (i=1,2,3,...) は自局の送受信装置を用いて、他基地局の放射している下り電波の電界強度を測定する。つまりその移動通信システムに割当てられている使用周波数帯域の全下りチャンネル周波数の電波（基地局から移動局向けの電波）を順次受信し、その電界強度を測定する（S<sub>11</sub>）。その測定結果中に、電界強度が所定値E<sub>1</sub>以上のもの、つまり自基地局BS<sub>i</sub>に隣接している基地局からの電波と認められる電界強度のものを採す（S<sub>12</sub>）。所定値E<sub>1</sub>以上のものがあれば、それを送受信装置で受信し、上述の判定条件に従ってその下り電波が自基地局と共通の移動通信システムに属する他基地局からのものであるかを解析する（S<sub>13</sub>）。つまりその基地局BS<sub>i</sub>で受信レベルが所定値以上の電波について、その電波が共通の移動通信システムの制御チャンネルとして受信可能であるか否かを解析する。この解析の結果に基づき周辺基地局であるか否かの判定を行い（S<sub>14</sub>）、隣接基地局一覧情報を作成する（S<sub>15</sub>）。

【0017】例えば図2の表に示すように、受信した各下り電波周波数（チャンネル）#1、#2、...について、その電界強度を記録し、電界強度が所定値E<sub>1</sub>以上のものについては、同一通信方式の電波であるか異方式の電波であるかの分類を記録し、更に、所定値以上でかつ同一方式のものは周辺（隣接）基地局であることを示す記録（図では○印）を行い、その他は周辺基地局でないことを示す記録（図では×印）を行う。

【0018】周辺基地局とされる数が予め決められている場合は、同一方式で、かつ所定電界強度E<sub>1</sub>以上のものから電界強度の高い順に所定数を周辺基地局とする。このようにして、各基地局BS<sub>i</sub>でその周辺基地局一覧情報の作成、更新をする。図2の例では図1中のゾーンZ<sub>1</sub>の基地局BS<sub>1</sub>が作成した一覧情報であって、電界強度が所定値以上の同一方式基地局BS<sub>4</sub>（周波数#4）、BS<sub>2</sub>（周波数#1）、BS<sub>3</sub>（周波数#3）の3つが隣接基地局と判定され、基地局BS<sub>5</sub>（周波数#5）、BS<sub>6</sub>（周波数#6）は同一方式であるが隣接基地局と判定されず、ゾーンZ<sub>1</sub>の基地局BS<sub>7</sub>（周波数#2）は地域的に近接しているが、方式が異なり、隣接基地局とならない。

【0019】このような基地局一覧情報の作成は、移動システムを作った場合、基地局を増設した場合に行うのみならず、運用状態に入った後に定期的に行い、大きなビルディングや塔などが建てられたり、取りこわされたことにもとづく、電波環境の変化に対応させる。

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B：基地局で測定し、移動局で解析

この発明の第2の観点による方法では、図3Bに示すように、基地局BS<sub>i</sub>で下り電波の電界強度の測定を行い（S<sub>21</sub>）、その電界強度が所定値E<sub>1</sub>以上のものであるかの判定を行う（S<sub>22</sub>）ことは図3Aの場合と同様であるが、第2の観点では、基地局BS<sub>i</sub>はその電界強度が所定値E<sub>1</sub>以上の周波数の電波について、これらが共通の移動通信システムの電波であるか否かの解析要求を自ゾーン内の移動局MSへ送信する（S<sub>23</sub>）。この要求を受信した移動局MSは例えば要求された周波数の下り電波の受信を行い、それらの下りの制御チャンネルとして受信できるか否か、又は制御チャンネルを利用してゾーン移行によるチャンネル切替えを行い、要求された下り電波（通話チャンネル）に切替えることができるかできないかなど、前述の判定条件に従って、要求された下り電波が同一通信システムのものか異システムのものか、雑音電波であるかなどの解析を行う（S<sub>24</sub>）。その移動局はこの解析結果を得て前記要求を出した基地局BS<sub>i</sub>へ報告する（S<sub>25</sub>）。この報告を受けた基地局BS<sub>i</sub>はその報告をもとに図3Aの場合と同様に周辺基地局か否かの判定を行い（S<sub>26</sub>）、更に基地局一覧情報の作成、更新をする（S<sub>27</sub>）。

【0020】C：移動局で測定し、基地局の指定する電波を移動局で解析

この発明の第3の観点による方法では、図3Cに示すように、移動局MSは、その在圏ゾーンZ<sub>1</sub>の基地局BS<sub>i</sub>の下りチャンネル周波数以外の周波数の電波の電界強度の測定を行い（S<sub>31</sub>）、その測定結果を在圏基地局BS<sub>i</sub>に報告する（S<sub>32</sub>）。その報告を受けた基地局BS<sub>i</sub>はその報告をもとに電波が到来していると判断される周波数の一覧表を作り、この一覧表をもとに測定電界強度がその電波の解析を行うことができるか否かの判定を行い、その解析可能な電波について解析をする要求を移動局MSへ送信する（S<sub>33</sub>）。この要求を受けた移動局MSはその指示された電波の受信を行い、受信できる場合はその電波が同一通信システムの基地局からの電波であるか否かの解析を行い（S<sub>34</sub>）、その解析結果を基地局BS<sub>i</sub>に報告し（S<sub>35</sub>）、基地局BS<sub>i</sub>はその報告をもとに周辺基地局かの判定を行い（S<sub>36</sub>）、基地局一覧情報の作成、更新を行う（S<sub>37</sub>）。

【0021】D：移動局で自律的に測定と解析し、基地局に報告

この発明の第4の観点による方法では、図4Aに示すように、移動局MSで周期的にその在圏ゾーンZ<sub>1</sub>の基地局BS<sub>i</sub>以外の下り電波を順次受信してその電界強度の測定を行い（S<sub>41</sub>）、その測定結果から在圏ゾーンZ<sub>1</sub>の基地局BS<sub>i</sub>の下り電波以外の下り電波があるか否かの判定を行う（S<sub>42</sub>）。自基地局BS<sub>i</sub>の下り電波以外の下り電波があればその一覧表を作り、その各電波について、同一通信システムの制御チャンネルの電波であるか否かを解析を行

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い(S<sub>u1</sub>)、その解析結果にもとづき、在圏ゾーンZ<sub>1</sub>の基地局BS<sub>1</sub>の周辺基地局状態、つまり、周辺基地局の数が制限されている場合はその数以下のものを周辺基地局と判定し(S<sub>u1</sub>)、その情報を在圏基地局BS<sub>1</sub>に報告する(S<sub>u2</sub>)。この報告を受信した基地局BS<sub>1</sub>はこの報告をもとに、隣接基地局一覧情報の生成、更新を行う(S<sub>u3</sub>)。

【0022】E：ゾーン移行時に移動局で測定、解析し、移行先基地局に報告

この発明の第5の観点による方法では、図4Bに示すように、移動局MSがゾーン移行時に、それまでの在圏ゾーン(移行元ゾーン)の基地局の下り制御チャンネル電波と新規に在圏しようとするゾーン(移行先ゾーン)の基地局の下り制御チャンネル電波の各電界強度を測定し

(S<sub>u1</sub>)、その測定結果から移行元ゾーンが、移行先ゾーンの隣接周辺であるか否かの判定を行い(S<sub>u2</sub>)、隣接周辺であると判定されると、移行元ゾーンの存在を、移行先基地局へ通知する(S<sub>u3</sub>)。この報告を受信した移行先基地局では、この報告をもとに隣接基地局一覧情報の生成、更新を行う(S<sub>u4</sub>)。

【0023】F：ゾーン移行時に移動局が測定し、移行先基地局が解析

この発明の第6の観点による方法では、図4Cに示すように、移動局MSがゾーン移行時に、移行元基地局の下り制御チャンネル電波と、移行先基地局の下り制御チャンネル電波との各電界強度を測定し(S<sub>u1</sub>)、その測定結果を移行先ゾーンの基地局へ報告する(S<sub>u2</sub>)。この報告を受信した基地局はその報告から移行元ゾーンが移行先ゾーンの隣接周辺であるかの判定を行い(S<sub>u3</sub>)、その判定結果により隣接基地局一覧情報の生成、更新を行う(S<sub>u4</sub>)。

【0024】G：組み合わせ

第7の観点による方法では、第1乃至6の観点による方法の任意の複数を組合せて用いる。例えば、第2の観点による基地局での他基地局の下り電波の受信測定により、移動局で解析をさせる方法と、第3の観点による移動局MSで自律的に在圏ゾーン基地局以外の下り電波の測定する方法とを組合せて使用する。この第7の観点による方法に更に第6の観点による方法を組合せてもよい。

【0025】

【発明の効果】以上述べたこの発明の方法によれば以下のような効果が得られる。

(a) 移動通信の運転中に測定評価を行うことができ、短時間で周辺基地局情報の異常を検出する事ができる為に周辺変化や無線基地局配置状況の変更に伴う隣接基地局の変更を自動的に追従させる事ができ、集約制御装置を介した管理制御や人為的管理が不要となる。

【0026】(b) 隣接基地局となるべきでない他基地局の下り電波の異常検出が自律的に行なわれるため、各無

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線基地局に対して複数の選択可能な周波数を事前に割り当てておけば異常発生の際合いによりこの周波数を各無線基地局自身に切り替えさせる事ができる。

(c) 隣接基地局の変更を周辺環境の変化に追従できる為に、設置計画が不要となる。

【0027】(d) 無線基地局相互のゾーン(サービスエリア)が重なっている場合や、立体的配置等による特種なゾーン配置、更には電波の反射や複雑な伝播経路等の為に、距離的に遠方となるにも関わらず隣接周辺となる基地局が発見される為、これらを含めた高精度な隣接周辺ゾーン状態の認識が可能となる。

(e) 無線基地局は、通常自局が送信する下り電波の届く範囲から発射される電波の電界強度を受信装置の受信限界としている。このために、自ゾーン外から発射される電波は、自局の受信装置の受信性能の限界を超える低い電界強度となるために検出することは出来ない。基地局の受信装置に於て、極端に低い電界強度を受信できる等の受信能力の拡大は、構造上複雑となり、さらに価格の増大と装置の大型化を引き起こす可能性が大きい。しかし第3乃至6の観点の方法では移動局を併用することで無線基地局の受信範囲が多目的に大幅に拡大され、精度を向上させることが可能となる。

【0028】つまり、例えば図5に示すように基地局BS<sub>1</sub>のゾーン(サービスエリア)Z<sub>1</sub>と基地局BS<sub>2</sub>のゾーンZ<sub>2</sub>との境界部分は重なっており、この重なり領域A<sub>1</sub>に位置した移動局は基地局BS<sub>1</sub>、BS<sub>2</sub>の何れからも下り電波を受信でき、かつこの領域A<sub>1</sub>の移動局から発射される上り電波を基地局BS<sub>1</sub>、BS<sub>2</sub>はそれぞれ受信可能な最低の電界強度で受信することができる。従って、基地局BS<sub>1</sub>で基地局BS<sub>2</sub>の下り電波を測定しようとすると同述したように問題が生じるが、移動局を利用することにより、基地局BS<sub>1</sub>では領域A<sub>1</sub>、つまり自ゾーンZ<sub>1</sub>での基地局BS<sub>2</sub>の下り電波の電界強度を移動局を利用して測定することができる。つまり基地局BS<sub>2</sub>の単独での受信範囲を等価的に2倍にしたことになる。

【図面の簡単な説明】

【図1】サービスエリア内のゾーンと基地局の配置を示す図。

【図2】隣接基地局一覧情報の例を示す図。

【図3】Aはこの発明の第1の観点による方法の手順を示す流れ図、Bはこの発明の第2の観点による方法の手順を示す流れ図、Cはこの発明の第3の観点による方法の手順を示す流れ図。

【図4】Aはこの発明の第4の観点による方法の手順を示す図、Bはこの発明の第5の観点による方法の手順を示す図、Cはこの発明の第6の観点による方法の手順を示す図。

【図5】隣接基地局とそのサービスエリアとの関係を示す図。

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【図1】

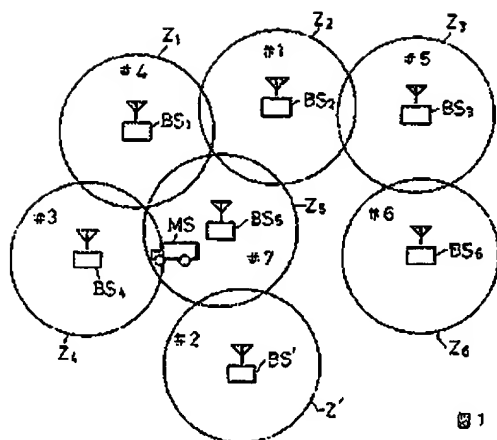


図 1

【図2】

周波数	受信感度	検出遅延	周波数帯域
#1	30db $\mu$	同一	○
#2	40db $\mu$	異方式	×
#3	30db $\mu$	同一	○
#4	30db $\mu$	同一	○
#5	-50db $\mu$		×
#6	0 db $\mu$		×

○ 隣接周波数と判断される周波数帯域

× 隣接周波数でない判断される周波数帯域

図 2

【図3】

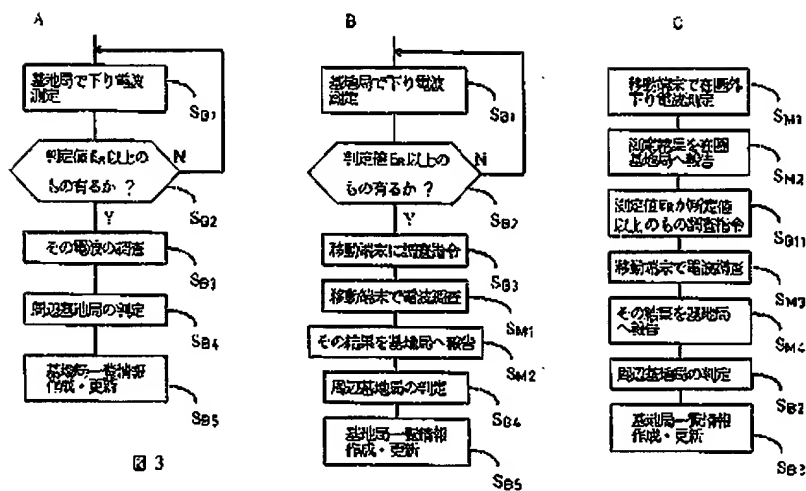


図 3

【図5】

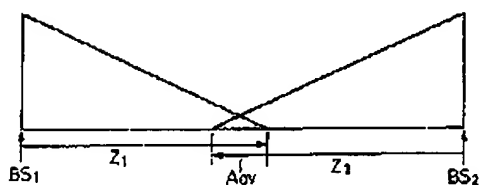


図 5

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【図4】

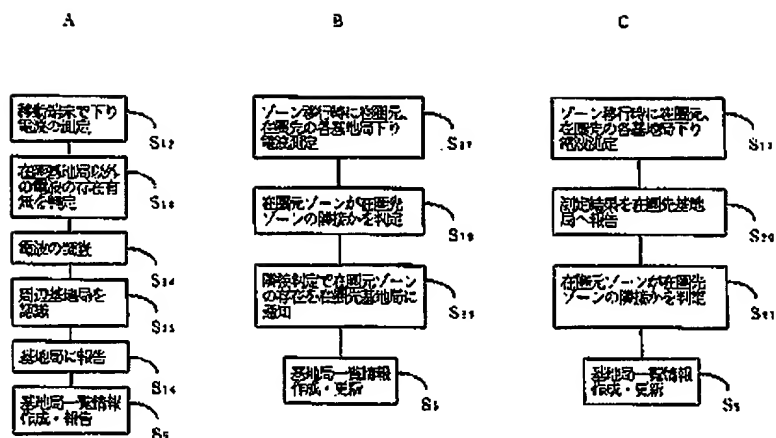


図4

フロントページの続き

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1. This document has been translated by computer. So the translation may not reflect the original precisely.

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3. In the drawings, any words are not translated.

[Claim(s)]

[Claim 1] It is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively. : containing the following steps (a) The perimeter wave number gets down in each zone, measure the field strength of an electric wave, and it judges whether field strength is beyond default value. (b) The field strength beyond the above-mentioned default value gets down, and analyze an electric wave, and get down and it judges [ those ] whether an electric wave is an electric wave of the above-mentioned common migration communication system. (c) The frequency channel of the electric wave judged that the measured field strength is beyond the above-mentioned default value, and is what is used with communication system common to the above is generated as frequency channel information on a circumference base station.

[Claim 2] : which is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively, and contains the following steps (a) In a base transceiver station A self-base transceiver station gets down and the field strength of the electric wave of all going-down frequency bands other than a frequency is measured, respectively. (b) It judges whether it gets down from the measurement result to the perimeter of a self-base station, and an electric wave exists, and is (c). As opposed to the electric wave of the frequency judged that exists the base transceiver station itself by the receive section It analyzes whether it is what is used for migration communication system with the electric wave common to the above. (d) Based on the analysis result, it judges whether the base transceiver station which has discharged those electric waves is a circumference base station, and is (e). Based on the above-mentioned measurement result and an analysis result, the circumference base station condition of the above-mentioned self-base transceiver station is recognized, and generation of adjoining base station list information and updating are performed.

[Claim 3] : which is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively, and contains the following steps (a) In a base transceiver station A self-base transceiver station gets down and the field strength of the electric wave of all

going-down frequency bands other than a frequency is measured. (b) It judges whether it gets down from the measurement result to the perimeter of a self-base station, and an electric wave exists. (c) The electric wave of the frequency judged that exists transmits the demand which analyzes whether it is what is used for migration communication system common to the above to a mobile station. (d) The mobile station which received the above-mentioned demand analyzes that it is what is used for migration communication system with the electric wave of the directed frequency common to the above. (e) The analysis result is reported to the base transceiver station which received the demand, and it is (f). The base transceiver station which received the above-mentioned report The base transceiver station which has discharged the electric wave based on the analysis result judges that it is a circumference base station, and it is (g). Based on the above-mentioned measurement result and an analysis result, the circumference base station condition of a self-base transceiver station is recognized, and generation of adjoining base station list information and updating are performed.

[Claim 4] It is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively. : containing the following steps (a) The base transceiver station of a \*\*\*\* zone gets down with a mobile station, and the field strength of the electric wave of total going-down frequencies other than a frequency is measured. (b) The measurement result is reported to the base transceiver station of the above-mentioned \*\*\*\* zone, and it is (c). The above-mentioned base transceiver station which received the above-mentioned report Specify the frequency of the electric wave and whether the electric wave more than predetermined field strength existing in the measurement result and the analysis demand of being that by which these field strength is used for migration communication system common to the above of the electric wave beyond a predetermined value if it judges and exists are transmitted to the above-mentioned mobile station. (d) The mobile station which received the above-mentioned demand analyzes to the electric wave of the directed frequency. (e) The above-mentioned mobile station reports the analysis result to the above-mentioned base transceiver station which received the demand, and is (f). The base transceiver station which received the above-mentioned report The base transceiver station which has discharged those electric waves based on the above-mentioned measurement result and an analysis result judges that it is a circumference base station, and it is (g). The circumference base station condition over a self-base transceiver station is recognized, and it updates by generating it, using adjoining base station list information as the above-mentioned adjoining zone information.

[Claim 5] It is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively. : containing the following steps (a) The field strength of the electric wave of all going-down frequency bands is autonomously measured in a mobile station. (b) It judges whether the measurement result to the above-mentioned mobile station gets down from other surrounding base transceiver stations of the base transceiver station in \*\*\*\*, and an electric wave exists. (c) The above-mentioned mobile station analyzes to autonomy whether the electric wave judge that exists is used for migration communication system common to the above. (d) Have the above-mentioned analysis

result and the above-mentioned mobile station recognizes [ the mobile station ] the condition of the surrounding base transceiver station of the base transceiver station in \*\*\*\*. (e) The circumference information on the above-mentioned circumference base transceiver station managed by this is reported to the base transceiver station in the above-mentioned \*\*\*\*, and it is (f). The base transceiver station which received this report performs generation of adjoining base station list information, and updating based on this report.

[Claim 6] It is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively. : containing the following steps (a) Measurement of the field strength of the going-down control channel electric wave discharged from the base transceiver station of the above-mentioned shifting agency zone in a mobile station in case zone shift is carried out from the shifting agency zone in current \*\*\*\* to a shift place zone, Measurement of the field strength of the control channel electric wave discharged from the base transceiver station of the above-mentioned shift place zone is performed. (b) Based on these measurement results, it judges whether a shifting agency zone is the adjoining circumference of a shift place zone, and is (c). If judged with the adjoining circumference Existence of the base transceiver station of the above-mentioned shifting agency zone is notified to the base transceiver station of the above-mentioned shift place zone, and it is (d). The above-mentioned shift place base transceiver station which received the above-mentioned notice performs generation of adjoining base station list information, and updating based on this notice.

[Claim 7] It is the generation method of the adjoining zone information in each base station in the service area which consists of two or more zones in which the base transceiver station belonging to common migration communication system was established, respectively. : containing the following steps (a) Measurement of the field strength of the going-down control channel electric wave discharged from the base transceiver station of the above-mentioned shifting agency zone in a mobile station in case zone shift is carried out from the shifting agency zone in current \*\*\*\* to a shift place zone, Measurement of the field strength of the control channel electric wave discharged from the base transceiver station of the above-mentioned shift place zone is performed. (b) These measurement results are reported to the base transceiver station of the above-mentioned shift place zone. (c) Based on this report, the base transceiver station of a shifting agency zone judges whether it is the adjoining circumference of the base transceiver station of the above-mentioned shift place zone, and, as for the base transceiver station which received the above-mentioned report, generation of adjoining base station list information and updating are performed.

[Claim 8] : which contains the following steps further in the adjoining zone information automatic generation method of claim 3 (h) The base transceiver station in the \*\*\*\* gets down to the above-mentioned base transceiver station with the mobile station in \*\*\*\*, and the field strength of frequency electric waves other than a frequency is measured. (i) The measurement result is reported to the above-mentioned base transceiver station in \*\*\*\*. (j) If the above-mentioned mobile station judges whether the electric wave is analyzable and it judges that the base transceiver station which received the above-mentioned report can carry out from the reported measurement result It transmits to the

mobile station of an analysis demand of whether the electric wave is used for migration communication system common to the above, and is (k). The above-mentioned mobile station which received the above-mentioned demand It analyzes to the directed frequency electric wave, and is (l). That result is reported to the base transceiver station which received the demand, and it is (m). The base transceiver station which received this report The base transceiver station which carried out based on the information and has discharged the electric wave judges that it is a circumference base station, recognizes the circumference base station condition over (n) self-base transceiver station, and performs generation of the above-mentioned adjoining base station list information, and updating. [Claim 9] : which contains the following steps further in the adjoining zone information automatic generation method of claim 8 (o) With the above-mentioned mobile station Measurement of the field strength of the going-down control channel electric wave discharged from the base transceiver station of the above-mentioned shifting agency zone in case zone shift is carried out from the shifting agency zone in current \*\*\*\* to a shift place zone, Measurement of the field strength of the control channel electric wave discharged from the base transceiver station of the above-mentioned shift place zone is performed. (p) These measurement results are reported to the base transceiver station of the above-mentioned shift place zone. (q) Based on this report, the base transceiver station of a shifting agency zone judges whether it is the adjoining circumference of the base transceiver station of the above-mentioned shift place zone, and, as for the base transceiver station which received the above-mentioned report, generation of the above-mentioned adjoining base station list information and updating are performed.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the generation method of the circumference zone information which the base station of each zone in migration communication system reports to a mobile station.

[0002]

[Description of the Prior Art] In migration communication system, a service area is divided into two or more zones (cel), a base transceiver station is established in the zone, respectively, and a mobile station communicates with other mobile stations or a point-to-point-communication terminal through the base transceiver station of the zone using the channel of the frequency assigned to the zone which carries out a \*\* area. In migration communication system, once zone shift performing channel switching during a communication link, performing [ be / it / under / same zone / also setting ] channel switching during the communication link by degradation of a receive state or interrupting a communication link by zone shift, resuming a communication link through another base station is performed. In order to ensure [ and ] each control of channel switching or channel switching of a re-connection form to a high speed during such a communication link, a mobile station needs the information (namely, channel frequency of a circumference zone) about the base station and this which exist around a \*\* area base station. Therefore, the base transceiver station of each zone is always reported through a control channel to the mobile station in that zone by making the identification code and/or the channel frequency of this circumference base station into information information, for example, while accelerating channel change control of a mobile station by it, proper zone shift is performed. The control channel which reports such

circumference zone information (or it is also called circumference base station information) may be called a perch channel.

[0003]

[Problem(s) to be Solved by the Invention] A change of relocation of a base station, extension, abolition, and an allocation channel frequency etc. is made with change of expansion of the service area currently employed, contraction, and the communication link traffic distribution in area, change of a radio-wave-propagation environment (it is called a circumference environmental variation), etc. Each base station needs to change the circumference base station information which should be reported by the perch channel, when the use channel frequency of the circumference base station is changed with such modification. In the former, the electric wave from other base stations carried out field strength measurement with the receiving set in each base transceiver station (it is only described as a base station below), the input signal was analyzed, and human being did collection management of the information on that circumference base station, created the circumference base station information data which should be reported based on this, and had reported this circumference base station information to the mobile station in a zone through the perch channel. Or it was carrying out by the data transfer performed through an intensive control device.

[0004] Furthermore, when judging a circumference base station, the field strength of the radiated wave covering the large range from them was measured about each base transceiver station, and the contiguity condition of a base station is judged based on this measurement result. Therefore, there was a problem which needs a great effort and time amount for collection of data. the purpose of this invention is offering the approach out of which it has come generating circumference zone information's automatically.

[0005]

[Means for Solving the Problem] While according to radical Motohara \*\* of invention of claim 1 measuring the field strength of each frequency received and judging whether field strength is beyond default value Analyze the input signal and it judges whether the signal is the same migration communication system (namely, system by the same entrepreneur). When judged with the measured field strength being beyond default value, and it being the same communication system, it judges with the channel of the frequency being the thing of a circumference zone. In this case, measurement and analysis are performed in both the case where all of measurement and analysis are performed in a base station, the case where a mobile station performs all and that result is reported to a base station, the case where a mobile station measures, report to a base station, and a measurement result is analyzed in a base station, and a mobile station and a base station, and the case where an analysis result is reported to a base station etc. is possible for a mobile station.

[0006] According to invention of claim 2, exist around it in each base station, and also get down from a base station and the field strength of an electric wave is measured. Judge whether the circumference base station to a self-base station gets down from the measurement result, and an electric wave exists, and when it exists Judge whether it is that for which the electric wave is used by the same system in the analysis of an input signal in the base station, and from the result, the base station of the electric wave judges the circumference base station of a self-base station, and the circumference base station

condition over a self-base station is recognized. Adjoining base station list information is generated and updated automatically.

[0007] According to invention of claim 3, the above-mentioned analysis of claim 2 is made to perform to a mobile station, and generation of adjoining base station list information and updating are performed based on this report. According to claim 4 invention, the field strength of base station going-down electric waves other than a \*\*\*\* base station is measured with a mobile station, the measurement result is reported to the base station in \*\*\*\*, and based on the report, a base station makes it analyze whether the electric wave of opposite *Perilla frutescens* (L.) Britton var. *crispa* (Thunb.) Decne. is the thing of the same system, and performs generation of adjoining base station list information, and updating to a mobile station based on the analysis result in a base station.

[0008] According to invention of claim 5, it gets down with a mobile station and the field strength of an electric wave is measured, it analyzes whether it is the thing of the same system about the electric wave of the free \*\*\*\*\* outside, the circumference base station condition of a \*\*\*\* base station is recognized from the result, and generation of adjoining base station list information and updating are performed based on the information from a \*\*\*\* base station that delivery and this were received for circumference base station information to the \*\*\*\* base station.

[0009] According to invention of claim 6, if zone shift is carried out, that judgment result will be transmitted to a shift place base station, and a mobile station will carry out generation of adjoining base station list information, and updating based on this report in a shift place base station, when the field strength of the base station going-down electric wave of a shifting agency and each zone of a shift place is measured, and it judges whether a shifting agency zone is the circumference of a shift place zone from that measurement result and it is judged to be the circumference.

[0010] In invention of claim 7, the measurement result in claim 6 is reported to a shift place base station, it judges that it is said circumference in a shift place base station, and generation of circumference base station list information and updating are performed. In invention of claim 8, invention of claim 3 and invention of claim 4 are combined, and invention of claim 9 adds invention of claim 7 to invention of claim 8 further.

[0011]

[The gestalt and example] of implementation of invention For example, as shown in drawing 1, a service area is divided into two or more zones Z1 and Z2 and Z3 --, and they are base stations BS1, BS2, and BS3 to each zone. -- It is prepared. A mobile station MS is the zone Zi (i= 1, 2, --) which is \*\*\*\*(ing). Base station BSi It is a base station BSi about the communication link with other mobile stations or a built-in end by transmitting and receiving. It carries out by minding.

[0012] According to the principle of this invention, in order to collect the information on a circumference base station, the input signal of each frequency judges whether it is an input signal from the base station of the circumference zone in the same system. That is, while getting down from other base stations, receiving an electric wave and measuring the field strength, the measured input signal is analyzed and it judges whether the input signal is a signal from the base station of the same communication system (system by the same entrepreneur). Field strength is beyond default value, and to the same

communication system, a group, then when it is judged, the input signal judges with it being the signal transmitted from the circumference base station.

[0013] The criteria whose input signal is a signal from the base station of the same communication system have the following.

- Be in agreement with what the frequency is using by the system.
- the class (a digital signal) of signal is the same, and is ability ready for receiving. If systems differ, it can judge from the gestalten of a synchronizing signal differing.

[0014] - A modulating-signal format (configuration) be the same.

- If it is the information signal of the perch channel of an input-signal form zone, the identification number given to the communication system contained in the information signal should be a predetermined thing. When one or more which were beforehand decided of these conditions are satisfied, it judges with it being a signal from other base stations belonging to the same communication system. These measurement and analyses are performed for example, about a going-down control channel.

[0015] Thus, the case where it carries out by the base station independent, the case where each [ in a zone ] mobile station carries out and it reports to a base station, and the case where a base station and a mobile station carry out jointly are possible as a gestalt which carries out measurement of the field strength for collection of circumference base station information, and analysis of an input signal, and there are various operation gestalten as follows also about these.

A: When a base station performs measurement and analysis independently.

[0016] As shown in drawing 3 A by the approach by the 1st viewpoint of this invention, it is a base station BSi ( $i=1, 3$  [ 2 and 3 ], --). The field strength of the going-down electric wave which is emitting other base stations is measured using the transmitter-receiver of a local station. That is, sequential reception of the electric wave (electric wave for the mobile stations from a base station) of the total going-down channel frequency of the use frequency band currently assigned to the migration communication system is carried out, and the field strength is measured (SB1). Field strength is in the measurement result, the thing BSi, i.e., the self-base station, beyond the predetermined value ER. The thing of field strength accepted to be an electric wave from an adjoining base station is looked for (SB2). If there is a thing beyond the predetermined value ER, it is received by the transmitter-receiver, and according to above-mentioned criteria, will get down, and an electric wave will belong to a self-base station and common migration communication system, and also it will analyze [ the ] whether it is a thing from a base station (SB3). That is, the base station BSi It analyzes whether receiving level is ability ready for receiving as a control channel of migration communication system with the electric wave common about the electric wave beyond a predetermined value. Based on the result of this analysis, it judges whether it is a circumference base station (SB4), and adjoining base station list information is created (SB5).

[0017] The power receiving community reinforcement is recorded about going-down electric-wave frequency (channel) #1, #2, and --. for example, as shown in the table of drawing 2, it received -- each -- field strength about the thing beyond the predetermined value ER it is the electric wave of the same communication mode, or is the electric wave of a different method -- that classification -- recording -- further -- beyond a predetermined value -- and record (drawing O mark) which shows that the thing of the

same method is a circumference (contiguity) base station is performed, and others perform record (drawing x mark) which shows that it is not a circumference base station. [0018] When the number made into a circumference base station is decided beforehand, it is the same method and let a predetermined number be a circumference base station from the thing more than the predetermined field strength ER at order with high field strength. Thus, each base station BSi Creation of the circumference base station list information and updating are carried out. At the example of drawing 2, it is the base station BS 5 of the zone Z5 in drawing 1. It is the created list information. Field strength The same method base stations [ BS / BS and / 2 (frequency #1) ] 1 (frequency #4) beyond a predetermined value By judging three of BS4 (frequency #3) to be an adjoining base station, although the base stations [ BS / BS and / 6 (frequency #6) ] 3 (frequency #5) are the same methods, they are not judged to be an adjoining base station, but it is base station BS[ of zone Z' ]' (frequency #2). Although it is locally close Methods differ and it does not become an adjoining base station.

[0019] When it makes a mobile system, after creation of such base station list information goes into an employment condition, it it not only performs it, but [ when a base station is extended, ] is performed periodically, and a big building, a big column, etc. are built or it is made to correspond to change of the electric-wave environment based on having been pulled down.

B: a base station -- measuring -- a mobile station -- \*\*\*\* -- by the approach by the 2nd viewpoint of this invention As shown in drawing 3 B, it is a base station BSi. Although what it gets down, field strength of an electric wave is measured (SB1), and it judges whether the field strength is a thing beyond the predetermined value ER for (SB2) is the same as that of the case of drawing 3 A At the 2nd viewpoint, it is a base station BSi. The analysis demand of whether the field strength is the electric wave of migration communication system with these common about the electric wave of the frequency beyond the predetermined value ER is transmitted to the mobile station MS in a self-zone (SB3). The frequency demanded, for example gets down and the mobile station MS which received this demand receives an electric wave. Or channel switching by zone shift is performed using a control channel. a \*\*\*\*\* [ that it is receivable as those control channels from which it gets down ] -- According to or or the above-mentioned criteria [ having been required ] which can get down and can change to an electric wave (message channel) and which is impossible, it gets down and having been required analyzes whether whose an electric wave is the thing of the same communication system, the thing of a different system, and a noise electric wave (SM1). That mobile station is the base station BSi from which this analysis result was obtained and said demand was advanced. It reports (SM2). Base station BSi which received this report It judges that it is a circumference base station like the case of drawing 3 A based on that report (SB4), and creation of base station list information and updating are carried out further (SB5).

[0020] C: the electric wave which measures with a mobile station and a base station specifies -- a mobile station -- \*\*\*\* -- by the approach by the 3rd viewpoint of this invention, it is shown in drawing 3 C -- as -- a mobile station MS -- base station BSi of that \*\*\*\* zone Zi getting down -- measurement of the field strength of the electric wave of frequencies other than a channel frequency -- carrying out (SM1) -- that measurement result -- \*\*\*\* base station BSi It reports (SM2). Base station BSi which received that report The chart of the frequency judged that the electric wave has come based on that



report is made, it judges whether measurement field strength can analyze that electric wave based on this chart, and the demand which analyzes about the electric wave in which that analysis is possible is transmitted to a mobile station MS (SB1). The mobile station MS which received this demand receives that directed electric wave, when it can receive, it analyzes whether that electric wave is an electric wave from the base station of the same communication system (SM3), and it is a base station BSi about that analysis result. It reports (SM4) and is a base station BSi. A circumference base station is judged based on that report (SB2), and creation of base station list information and updating are performed (SB3).

[0021] D: a mobile station -- autonomous -- measurement -- analyzing -- a base station -- \*\*\*\* -- by the approach by the 4th viewpoint of this invention, it is shown in drawing 4 A -- as -- a mobile station MS -- periodic -- base station BSi of that \*\*\*\* zone Zi except -- getting down -- an electric wave -- sequential reception -- carrying out -- measurement of that field strength -- carrying out (SM1) -- base station BSi of that measurement result to the \*\*\*\* zone Zi It judges whether it gets down, and gets down other than an electric wave, and there is any electric wave (SM2). Self-base station BSi The chart will be made, if it gets down, it gets down other than an electric wave and there is an electric wave. It analyzes [ whether it is the electric wave of the control channel of the same communication system, and ] about each of that electric wave (SM3). It is based on the analysis result and is the base station BSi of the \*\*\*\* zone Zi. When the surrounding base station condition, i.e., the number of circumference base stations, is restricted, the following [ the number ] are judged to be a circumference base station (SM4), and it is the \*\*\*\* base station BSi about the information. It reports (SM5). Base station BSi which received this report Based on this report, generation of adjoining base station list information and updating are performed (SB1).

[0022] E: the time of zone shift -- a mobile station -- measurement -- analyzing -- a shift place base station -- \*\*\*\* -- by the approach by the 5th viewpoint of this invention As shown in drawing 4 B, at the time of zone shift, the base station of the \*\*\*\* zone (shifting agency zone) till then gets down, a control channel electric wave and the base station of the zone (shift place zone) which it is going to \*\*\*\* newly get down, and a mobile station MS measures each field strength of a control channel electric wave (SM1). If it judges whether a shifting agency zone is the adjoining circumference of a shift place zone (SM2) and is judged with it being the adjoining circumference from the measurement result, existence of a shifting agency zone will be notified to a shift place base station (SM3). In the shift place base station which received this report, generation of adjoining base station list information and updating are performed based on this report (SB1).

[0023] F: the time of zone shift -- a mobile station -- measuring -- a shift place base station -- \*\*\*\* -- by the approach by the 6th viewpoint of this invention, as shown in drawing 4 C, at the time of zone shift, a shifting agency base station gets down, and a shift place base station gets down, and a mobile station MS measures each field strength with a control channel electric wave (SM1), and reports that that measurement result is a control channel electric wave to the base station of a shift place zone (SM2). The base station which received this report judges whether a shifting agency zone is the adjoining circumference of a shift place zone from that report (SB1), and performs generation of adjoining base station list information, and updating by that judgment result (SB2).

[0024] G: Use by the approach by the 7th viewpoint of combination combining the plurality of the arbitration of the approach by the viewpoint of the 1st thru/or 6. For example, the other base stations in the base station by the 2nd viewpoint get down, and combination use of equipment of the approach of making it analyzing with a mobile station, and the approach to get down other than a \*\*\*\* zone base station autonomously, and measure an electric wave with the mobile station MS by the 3rd viewpoint, is carried out by reception measurement of an electric wave. The approach by the 6th viewpoint may be further combined with the approach by this 7th viewpoint.

[0025]

[Effect of the Invention] According to the approach of this invention described above, the following effectiveness is acquired.

(a) Measurement evaluation can be performed during operation of mobile communication, since the abnormalities of circumference base station information are detectable in a short time, modification of the adjoining base station accompanying perimeter change or modification of a base transceiver station arrangement situation can be made to follow automatically, and the supervisory control and artificial management through an intensive control unit become unnecessary.

[0026] (b) If two or more selectable frequencies are assigned in advance to each base transceiver station, this frequency can be made to be changed to each base transceiver station itself by the degree of an abnormal occurrence, since it should not become an adjoining base station, and also a base station gets down and malfunction detection of an electric wave is performed autonomously.

(c) Since modification of an adjoining base station can be followed at change of a perimeter environment, an installation plan becomes unnecessary.

[0027] (d) When the zone between base transceiver stations (service area) has lapped, since the special kind zone arrangement by three-dimensional arrangement etc. and the base station used as the adjoining circumference are discovered in spite of becoming a distant place in distance because of reflection of an electric wave, a complicated propagation path, etc. further, recognition of a highly precise adjoining circumference zone condition including these is attained.

(e) The base transceiver station makes field strength of the electric wave discharged from the range which a local station usually transmits, to which it gets down, and which an electric wave reaches the receiving limitation of a receiving set. For this reason, since it becomes the low field strength exceeding the limitation of the receiving engine performance of the receiving set of a local station, the electric wave discharged from the outside of a self-zone is undetectable. Expansion of the receiving capacity for extremely low field strength to be receivable etc. has large possibility of becoming complicated on structure and causing increase of a price, and enlargement of equipment further, in the receiving set of a base station. However, by the approach of the viewpoint of the 3rd thru/or 6, the receiving range of a base transceiver station is sharply expanded for multiple purposes by using a mobile station together, and it becomes possible to raise precision.

[0028] As it is got blocked, for example, is shown in drawing 5, it is a base station BS 1. A zone (service area) Z1 and base station BS 2 The boundary part with a zone Z2 has lapped. This lap field Aov The located mobile station gets down from all of base stations BS1 and BS2, can receive an electric wave, and is the field Aov of a parenthesis. They

are the base stations [ BS / BS and / 2 ] 1 about the going-up electric wave discharged from a mobile station. It is receivable with the minimum field strength receivable, respectively. therefore, base station BS 1 Base station BS 2 using a mobile station, although a problem arises as it mentioned above, when it was going to get down and was going to measure the electric wave -- base station BS 1 \*\*\*\* -- base station BS 2 of a field Aov Z1, i.e., a self-zone, It can get down and the field strength of an electric wave can be measured using a mobile station. That is, base station BS 2 It means doubling the receiving range of independent equivalent.

[Brief Description of the Drawings]

[Drawing 1] Drawing showing the zone in a service area, and arrangement of a base station.

[Drawing 2] Drawing showing the example of adjoining base station list information.

[Drawing 3] For the flow chart showing the procedure of the approach by the 1st viewpoint of this invention, and B, C is [ A ] the flow chart showing the procedure of the approach by the 2nd viewpoint of this invention, and the flow chart showing the procedure of the approach by the 3rd viewpoint of this invention.

[Drawing 4] For drawing showing the procedure of the approach by the 4th viewpoint of this invention, and B, C is [ A ] drawing showing the procedure of the approach by the 5th viewpoint of this invention, and drawing showing the procedure of the approach by the 6th viewpoint of this invention.

[Drawing 5] Drawing showing the relation between an adjoining base station and its service area.